

ATWATER KENT MANUFACTURING COMPANY,  
NORTH PLANT  
5000 Wissahickon Avenue  
Philadelphia  
Philadelphia County  
Pennsylvania

HAER No. PA-306-A

HAER  
PA  
51-PHILA,  
703A-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
Northeast Region  
Philadelphia Support Office  
U.S. Custom House  
200 Chestnut Street  
Philadelphia, P.A. 19106

HISTORIC AMERICAN ENGINEERING RECORD  
ATWATER KENT MANUFACTURING COMPANY, NORTH PLANT

HAER  
PA  
51-PHILA,  
703A-

HAER No. PA-306-A

**LOCATION:** 5000 Wissahickon Avenue, Philadelphia, Philadelphia County, Pennsylvania. USGS Germantown, PA Quadrangle, Universal Transverse Mercator Coordinates: 18.484990.4429510

**DATE OF CONSTRUCTION:** 1928-1929

**ENGINEER:** Walter Francis Ballinger, The Ballinger Company, Philadelphia, Pennsylvania

**PRESENT OWNER:** U.S. General Services Administration, Region 3  
100 Penn Square East, Philadelphia, Pennsylvania

**PRESENT OCCUPANT:** U.S. Department of Veterans Affairs

**PRESENT USE:** Federal offices and computer center

**SIGNIFICANCE:** The North Plant housed the second major factory of the Atwater Kent Manufacturing Company. Atwater Kent was an important twentieth-century inventor and manufacturer of radios and electrical components for automobiles. The company was the largest producer of radios in the world in the late 1920s. The plant is roofed with 470,000 square feet of "Super-Span Saw-Tooth" roof trusses patented by Walter Ballinger. Ballinger and his firm contributed significantly to the architecture and engineering fields. Today, the Ballinger firm claims to be the oldest continuously practicing architectural and engineering firm in the United States.

**PROJECT INFORMATION:** The North Plant was recorded in February, 1996, by the Cultural Resource Group of Louis Berger & Associates, Inc., East Orange, New Jersey, for the General Services Administration (GSA). The recordation was undertaken pursuant to a Memorandum of Agreement between the GSA, the Pennsylvania State Historic Preservation Officer, and the Advisory Council on Historic Preservation, executed in association with the planned demolition of the former Atwater Kent Manufacturing Company, North Plant. Project personnel included Richard M. Casella, Senior Architectural Historian; Leslie Frucht, Historian; and Rob Tucher, Senior Photographer.

## DESCRIPTION

The former Atwater Kent Manufacturing Company facility consists of two expansive radio manufacturing buildings located in northwest Philadelphia on two parcels of land totaling 34 acres (Figure 1). The two parcels are located on Wissahickon Avenue, separated by U.S. Route 1, formerly known as Roosevelt Boulevard, and Abbottsford Avenue. The first building was erected in 1923 on the southwest side of Abbottsford Avenue, and is known as the South Plant. The second facility was built in 1928 on the northeast side of Abbottsford Avenue, and is known as the North Plant.

The former Atwater Kent Manufacturing Company, South Plant, is bounded by SEPTA and Conrail tracks on the southwest, and Roberts Avenue and King Street on the southeast. The South Plant site presently consists of the original 1923 building, the southwest addition built in 1925, and a concrete block structure built in 1970 (Figure 2). The South Plant is not the subject of this recordation, and has been previously described in great detail in permanent literature by Fogg (1925), Ashworth (1926), and Barucco (1992). Ashworth's article provides a table entitled "Summary Data on Atwater Kent Plant," which lists in the greatest detail all of the physical characteristics of the facility, including the type and manufacturer of all the principal fixtures and mechanical equipment of the building.

The former Atwater Kent Manufacturing Company, North Plant, consists of five buildings with parking areas on a 27-acre industrial parcel. The property fronts to the northeast on Wissahickon Avenue, and is bounded by Abbottsford Avenue to the southeast, the SEPTA railroad tracks to the southwest, and the National Guard Armory to the northwest (Figure 2).

The dominating feature of the North Plant property is the immense, three-level manufacturing building, rectangular in plan and covering approximately 11 acres. The manufacturing building itself has been historically referred to as the North Plant. Other buildings comprising the facility include the Powerhouse, built in 1927-28 along with the North Plant; a one-story brick and concrete gatehouse; a four-story concrete storehouse; a one-story concrete utility building; and a large air-conditioning condenser unit (Figure 3). With the exception of the Powerhouse, the remaining structures on the property post-date the period of historical significance of the property.

The North Plant measures 911'-5" by 515'-5", with its long axis paralleling Wissahickon Avenue, and consists of a main level, a basement, and a sub-basement. Presently, the main level is used as government offices and the basements for storage. The building is constructed on a slope which drops nearly 40' between Wissahickon Avenue and the railroad tracks. As a result, the front elevation of the building is 28' in height, while the rear elevation is 68' in height. The foundation and structural frame of the building are reinforced concrete, and the exterior walls are load-bearing brick. The columns are spaced 40' on center, and carry a

proprietary saw-tooth roof system known as the "Super-Span Saw-Tooth" roof, designed by The Ballinger Company of Philadelphia, the building's architects. The 48 triangular roof sections each consist of an integral steel truss, north-facing glazing panels, and south-facing reinforced gypsum roof panels. Due to the recent failure and collapse of sections of the gypsum roof panels, the entire roof has been enclosed and supported from below with plywood and a wooden structural system. To reduce heat loss and water infiltration, the skylights were encapsulated with a fiberglass and polymer resin coating. Design details and the history of the development of the saw-tooth roof structure are further discussed below.

The brick exterior walls are organized into a system of bays flanked by shallow brick pilasters. The building is capped with a brick parapet ornamented with diamond-patterned frieze panels. Terra cotta is used for window sills, coping, and decorative belt-courses and downspout openings. The building's original metal-frame industrial windows have all been replaced with tripled 1/1 aluminum-frame insulated-glass replacement windows. Four sets of windows are located in each bay defined by the pilasters, except in the corner bays, which contain two sets. Other window openings have been enclosed with a variety of materials, including wood panels, brick, and glass block.

The principal entrances are located on the northeast side, and consist of four-bay pedestrian doors on the main and basement levels. The interior of the building has been extensively remodeled over the years with the addition of concrete block and gypsum board partition walls, various floor coverings, and escalators. The "Super-Span Saw-Tooth" roof trusses and skylights are completely obscured from view with a suspended ceiling. Originally, the ceiling was completely open to the main manufacturing floor. Unit heaters, a relatively new concept at the time, were suspended from the roof trusses. The heaters consisted of hot water radiators supplemented with electric fans to circulate the air. The skylight sections of the roof were of the movable type, operated by rods running down the columns, and provided ventilation on warm days. The movable lights are no longer operable since their sealing.

Sections of the original maple strip flooring on the main level are exposed in parts of the office areas. The interior of the building was originally planned as single open spaces on each level, interrupted only by restrooms, stairways, and elevator housings. Lower levels, which were used for storage and shipping of the finished products, are largely intact as originally designed, with open concrete columns, floors, and walls. Hanging fluorescent lighting fixtures and vinyl flooring tiles have been added.

The Powerhouse is a flat-roofed, rectangular-plan, brick industrial-type building, approximately 63' wide by 202' long. The Powerhouse was built to shelter two coal-fired boilers which provide steam heat to the main manufacturing building at the North Plant. The building is located on the western edge of the property, between the main manufacturing building and the tracks of the former Pennsylvania Railroad. The building is of riveted steel frame construction

with brick enclosure walls, and consists of three sections arranged linearly along the northwest-southeast axis of the building. The main section housing the boiler room occupies the north half of the building, followed by two smaller sections which house transformers, switching equipment, workshops, storerooms, and a locker room. Industrial-type metal-frame windows are stacked in tall vertical openings to form three bays across the ends of the building and twelve bays along its length. The building retains all of its original solid-section steel windows, which are divided into 14" x 20" lights with horizontally pivoting ventilators of either four or eight lights. The building retains two of its original exterior doors. They are large paired wood swinging doors with nine lights over two recessed panels.

The boiler room section visually dominates the building, due to its size and its distinctive exterior architectural detailing on the upper third of the walls. The boiler room section is six bays in length and more than twice the height of the adjoining sections, measuring 63' wide, 118' long, and 87' high. A stair and elevator tower located at the southwest corner rises an additional 16' above the roof, and provides access to five levels of steel catwalks within the open boiler room. The upper portions of the building's facades feature recessed brick panels, carrying smaller windows than the corresponding bays below, flanked by corbeled brick pilasters surmounted by decorative terra cotta capitals in the form of lancet windows with steep gable hoods. Decorative brick wall panels are located beneath the top windows of the tower and main block and feature diagonally patterned brickwork.

The three sections of the building are separated by interior brick fire walls and sliding steel fire doors which automatically close by gravity in the event of fire. Door openings in the interior brick walls are headed with brick rowlock arches. The west facade of the two smaller sections of the building features a high brick parapet which conceals the differing roof elevations. The parapet is decorated with corbeling, which outlines panels corresponding to the window openings below. The parapet of the entire building is capped with terra cotta tiles and scuppers.

## HISTORICAL INFORMATION

### *Background*

The Atwater Kent Manufacturing Company factory on Wissahickon Avenue in northwest Philadelphia was built by Arthur Atwater Kent between 1923 and 1929 for the purpose of manufacturing radios and associated components. The factory consisted of two main facilities known as the South and North plants, which together covered more than 34 acres. The South Plant was completed in 1923, and was expanded in 1925. The South Plant was later connected by an enclosed pedestrian bridge to the North Plant during construction of the latter in 1928 and 1929.

The Atwater Kent Manufacturing Company was incorporated in 1919 by Arthur Atwater Kent. The company was an outgrowth of two previous unincorporated companies formed by Kent: the Atwater Kent Manufacturing Works, a sole proprietorship founded in Philadelphia in 1902, and its predecessor, the Kent Electric Manufacturing Company, founded in Worcester, Massachusetts, in 1895. Both of these earlier firms engaged in the manufacture of small electrical items, including motors, fans, meters, and intercommunicating telephones (Douglas 1988:65; Ingham 1983:707).

Kent was born in Burlington, Vermont, in 1873. He attended Worcester Polytechnic Institute, but left there in 1895 after two years of study to form the Kent Electric Manufacturing Company. The company produced motors and fans which Kent marketed himself through magazine advertising and sales trips through the Northeast. During a trip to Philadelphia, Kent became excited about the business prospects in that city and in 1902 relocated there, opening the Atwater Kent Manufacturing Works in a loft at 6th and Arch streets (Douglas 1988:65; Ingham 1983:707).

Kent was a prolific inventor who obtained 93 patents over his career. He manufactured many of his inventions himself, constantly adding to his product line. He diversified into electrical components for automobiles, and achieved a huge success in 1905 with his invention of an improved engine ignition system he called the Unisparker. His device produced a single quick hot spark instead of the ordinary stream of sparks, and combined ignition points, condenser, centrifugal advance mechanism, and distributor in one unit. The Unisparker was immediately adopted by a dozen automobile manufacturers, and the general concept was in use in automobiles until the recent development of fully electronic systems. The Franklin Institute of Philadelphia awarded Kent the John Scott Medal for inventive achievement in 1914 (Douglas 1988:65; *Newsweek* 1939:26,27; *New York Times* 1949:17).

By 1911, Kent's company had grown to 125 employees, and moved to larger manufacturing facilities on Stenton Avenue in Philadelphia. Automobile starters and lighting systems were added to the line, and during World War I, Kent received government contracts for the production of fuse-setters, clinometers, and optical gun sights. With the economic slowdown following the war, and because more auto manufacturers were installing their own ignition systems, business began to slump. Kent incorporated in 1919, and began to look for other electrical products to manufacture (Douglas 1988:65).

The public was fascinated with radios, and by 1921, Kent was moving rapidly into the burgeoning new field. He possessed the necessary specialized tooling and equipment for working with Bakelite, an extremely tough synthetic insulator used in electrical equipment. The company began with the manufacture of radio components and quickly moved into the manufacture of complete radios. The fall and winter was the radio "season," and each year

there was tremendous competition among the hundreds of manufacturers to bring forth new and improved models. Kent brought numerous firsts to the radio marketplace, including radios operating on alternating current. He popularized one-dial tuning and the sheet metal cabinet, which further reduced production costs and expanded the low-end market (Douglas 1988:65).

While maintaining high quality, he continually drove the price of radios down through large-scale and efficient production methods. In 1923, Kent began construction of a new manufacturing facility in northwest Philadelphia. Kent hired the architectural engineering firm The Ballinger Company of Philadelphia to design the facility, utilizing the "Super-Span Saw-Tooth" roof trusses patented by Walter Francis Ballinger and Clifford H. Shivers (Fogg 1925:140-141; U.S. Patent Office 1920).

Kent believed strongly in advertising, and mounted extensive campaigns on radio and in magazines and newspapers which kept him in position as the market leader. In 1925, Kent sponsored the Atwater Kent Hour radio program, which featured the leading musical talents of the day and quickly became one of the most popular radio programs. By 1927, Kent was spending over three million dollars a year on printed advertising and seven thousand dollars a week on his radio program. In that same year, the South Plant produced over one million radios, the greatest production of any radio manufacturer in the world (Douglas 1988:65; Ingham 1983:707). In 1928, Kent expanded the facility with the construction of the North Plant, again hiring The Ballinger Company and employing their special roof system. It was at that time that the pedestrian bridge was built over Abbottsford Avenue, connecting the North and South plants. The bridge was later demolished with the construction of Route 1. With the completion of the North Plant, production rose to over 6,000 radios per day, totaling nearly 2.2 million units per year and employing approximately 12,000 workers (Ingham 1983:708; *New York Times* 1949:17).

Kent's success in the manufacture of radios was not primarily due to his inventive genius, as was the case with his earlier electrical devices. All of the radio manufacturers relied on patented technology controlled and licensed by the Radio Corporation of America (RCA). Kent illegally "borrowed" proprietary technology, assembled it in a more attractive product at a lower price, flooded the market with advertising, and captured millions of dollars in sales before the legal system could catch up. In 1927, Kent lost two patent infringement suits brought by RCA and the Hazeltine Corporation (Ingham 1983:708).

The meteoric rise of the company was followed by an equally rapid fall during the years of the Depression. Along with the economic downturn came overpowering competition from other radio manufacturers such as Philco, and increasing demands from labor unions. Kent was forced to cut his workforce, and in 1931, he set up a private relief fund to assist 3,500 of his former employees who could not find other work. By 1936, Kent's labor force had been cut to 800

employees, and Kent decided to get out of the business entirely while his personal fortune was still intact. In that year, Kent dissolved the corporation, auctioned off the equipment, and permanently closed his sprawling plant. Over the next two years, Kent restored the Betsy Ross house in Philadelphia, and also restored the old Franklin Institute, which he donated to the city for use as a museum of Philadelphia history. In 1938, the city renamed it the Atwater Kent Museum. With a fortune estimated to be in the millions, Kent retired to Bel Air, California, where he pursued social and philanthropic activities until his death in 1949 (Ingham 1983:708; *Newsweek* 1939:26-27; *New York Times* 1949:17).

Kent sold the North Plant on August 1, 1941, to the U.S. Signal Corps for \$2 million, after the government had filed condemnation proceedings in Federal District Court one week earlier. According to a government press release, the 740,000-square-foot building and the land represented an investment of \$3.5 million. The Signal Corps Depot officially celebrated its opening on November 15, 1941, with ceremonies attended by Philadelphia Mayor Bernard Samuels and U.S. Senator Hugh Scott. In 1949, ownership of the building was transferred to the newly formed General Services Administration (GSA). The GSA completed the conversion of the building from manufacturing space to office space and records storage, a use which continues today. The building's first tenant under the GSA was the Veterans Administration in 1949, joined by the National Archives in the 1950s and the U.S. Treasury in the 1960s (GSA 1995).

### *The Ballinger Company's "Super-Span Saw-Tooth" Roof*

The saw-tooth roof was first used in Europe in the late nineteenth century, becoming popular in the United States around the turn of the century. Also known as a weaving shed roof, the structure consisted of a low-slope section of solid roof supported by a very steep-slope section of glazed roof. The glazing was oriented to face north to provide a "constant and agreeable light while doing away with the use of window shades" (Ketchum 1912:182). Saw-tooth roofs, in general, present difficulties, which include the design and maintenance of a watertight gutter system, the problem of condensation on the interior surfaces of the glazing, and the tendency for snow to drift into the roof valleys and obscure all available light. Various modifications to the basic design of saw-tooth roofs were proposed by engineers during the early twentieth century to reduce or eliminate the shortcomings. While these designs met with various degrees of success and acceptance, it was not until 1920 that a patent would be issued for a radically improved version of the roof type.

In July 1919, Walter F. Ballinger of Philadelphia, and Clifford H. Shivers of Woodbury, New Jersey, filed an application with the U.S. Patent office for a new type of roof structure, consisting of a unique combination of trusses and saw-tooth roof construction (Figures 4, 5, and

6). In general, the new system provided the benefits of natural lighting afforded by a saw-tooth roof which had long spans made possible by two interacting trusses. A patent was issued in July 1920 (U.S. Patent No. 1,347,669), which the inventors assigned to the firm of Ballinger and Perrot (U.S. Patent No. 1,347,669). The following is excerpted from the patent:

We have found that by a special construction, comprehending the tying together of the several ridges of the saw-tooth structures of the roof, by means of longitudinal upper compression chords in the form of girders rigidly fastened to each of the ridges of the saw-tooth roof section, coupled with corresponding tie tension chord members at the base of the roof trusses and deep transverse trussed girders respectively at the high portion of each saw-tooth section (to which the compression and tension chords are connected) for providing great transverse width of span, we are enabled to convert what has heretofore been a weak sectional construction, requiring a large number of under supports intermediate of the four corners, into a rigid self supporting unitary structure having great strength both longitudinally and transversely, whereby all supports, excepting those at the intermediate corners, may be eliminated. We have further found that by the reason of the reduction of cost, due to the elimination of many of the numerous supports, heretofore necessary, we can very materially cheapen the total cost of construction of a building, while maintaining the strength of its roof and further obtain the additional advantage of elimination of the obstructing supports heretofore deemed necessary throughout the room space.

In 1920, Ballinger's firm reorganized under the name The Ballinger Company, and an aggressive marketing campaign for the new roof was made under the name "Super-Span Saw-Tooth" roof. Although the "Super-Span Saw-Tooth" roof did not eliminate the problems of drainage, condensation, and snow accumulation, its long open spans appealed to manufacturers utilizing hundreds of "bench workers" working on assembly lines or along conveyor belts. An open span floor plan simply allowed greater versatility to changes in production layout. The abundant diffused lighting was understood to increase productivity and reduce eye strain for workers engaged in intricate or minute assembly operations.

By 1924, when The Ballinger Company published their promotional brochure, *Buildings for Commerce and Industry*, the company highlighted the major applications of the "Super-Span Saw-Tooth" roof completed to date. These included weaving sheds at the Guarantee Silk Company, Nanticoke, Pennsylvania, and the Ardross Worsted Company, Philadelphia; the radio manufacturing building of the Atwater Kent Manufacturing Company; and several buildings at the Edward G. Budd Manufacturing Company, Philadelphia (The Ballinger Company 1924:45, 47, 50, 51).

### *History of The Ballinger Company*

The Ballinger Company, today known as Ballinger, a Pennsylvania corporation located in Philadelphia, claims to be the oldest continuously practicing architectural and engineering firm in the United States. The firm was founded in 1878 by Walter H. Geissinger to provide creative, cost-effective design solutions for institutions, corporations, and industry. Shortly after its founding, Edward Hales was brought in as a partner, and the firm was renamed Geissinger and Hales. Upon Geissinger's retirement in 1894, Walter F. Ballinger joined the firm, and the firm was renamed Hales and Ballinger. The following year, the firm hired Emile G. Perrot (1872-1954) as head draftsman. Perrot was a native of Philadelphia, and had just graduated from the University of Pennsylvania with a B.S. in architecture. In 1901, Hales left the firm, and Perrot joined Ballinger in partnership. The firm was officially renamed Ballinger and Perrot in 1902 (Ballinger 1995:2; *National Cyclopedia of American Biography* [NCAB] 1967:24).

Perrot took an early interest in reinforced concrete buildings and eventually gained national recognition for his innovative design work in that area. In 1907, Perrot designed the first 10-story loft building in Philadelphia entirely of structural concrete for the Boyertown Burial and Casket Company. Perrot was granted several patents, including a design for a unit girder frame system (circa 1900) for reinforced concrete which was considered to be far in advance of prefabricated concrete construction (NCAB 1967:24).

Ballinger and Perrot also had their own ideas about what constituted advertising of the firm's services. Professional architects, like lawyers, simply did not advertise, and membership in the American Institute of Architects (AIA) prohibited all forms of self-promotion. In 1905, Ballinger and Perrot, as well as two other prominent Philadelphia firms, were called before the board of the Philadelphia Chapter of the AIA and ordered to cease distribution of brochures and pamphlets promoting the firm's designs. While the others complied, Ballinger and Perrot refused, as long as supplies lasted. After running newspaper advertisements in 1907 and continuing to distribute their company publications, they were again threatened with expulsion from the AIA. What Ballinger did is not clear, but by 1913, Perrot had quit the organization and did not rejoin until 1925 (Tatman and Moss 1985:603).

In 1911, Perrot traveled in Europe to study industrial plants and their adjoining villages at the invitation of the Viscose Company of England. Consequently, in 1916, the American Viscose Company hired Ballinger and Perrot to design the company's new "industrial village" at Marcus Hook, Pennsylvania, consisting of 11 manufacturing buildings and 262 dwellings for employees (NCAB 1967:24).

By 1915, Ballinger and Perrot was one of the largest commercial and industrial design firms in the United States, with a staff of 300 divided between Philadelphia and New York. During the

first quarter of the century, Ballinger and Perrot designed a number of landmark projects for major companies, including several facilities for RCA's Talking Machine Division in Camden, New Jersey, Joseph Campbell's first plant (now the Campbell Soup Company), and the huge new manufacturing plant for the Atwater Kent Company (Ballinger 1995:2).

The year 1920 became a decisive one for the firm of Ballinger and Perrot. Ballinger, and Clifford H. Shivers of Woodbury, New Jersey, received a patent for a new type of saw-tooth roof structure which they subsequently named the "Super-Span Saw-Tooth" roof. Perrot, still absorbed with innovating concrete construction, obtained a patent for a cement gun for spraying stucco on concrete frame buildings. Each man wanted to take the firm in the direction of his own special interests, which led them to dissolve the partnership and go their separate ways. Ballinger acquired sole interest in the company and its assets, including the rights to the roof patent. Renaming the firm The Ballinger Company, Ballinger and his senior partner, Carl deMoll, began an aggressive promotion of his new roof design. Perrot went into private practice, which he maintained until his death in 1954 (NCAB 1967:24; Tatman and Moss 1985:603).

Walter Ballinger was killed in an automobile accident in 1924, at which time control of the firm was in the hands of deMoll and other partners. Upon his graduation from college in the late 1920s, Robert Ballinger, Walter's son, assumed the position of Chief Executive Officer and renamed the firm Ballinger. Carl deMoll's two sons, John and Louis, joined the firm in the mid-1940s, and became partners in the mid-1950s. Robert Ballinger retired in 1965, and since that time, the firm has undergone numerous changes in ownership and management. Today, the firm of Ballinger employs approximately 100 people and ranks among the top five architecture firms in Philadelphia (Ballinger 1995:3-4).

## BIBLIOGRAPHY AND REFERENCES CITED

Ashworth, Harold

- 1926 "The Modern Manufacturing Plant: Atwater Kent Company has World's Largest Radio Factory, a Single Story Building with 15 Acres Under Glass." *Manufacturing Industries*, January, pp. 7-10.

Ballinger

- 1995 *History of Ballinger*. Unpublished manuscript provided by Ballinger, 2005 Market Street, Philadelphia, Pennsylvania.

Ballinger Company, The

- 1924 *Buildings for Commerce and Industry*. The Ballinger Company, Philadelphia. Located in the Philadelphia Athenaeum, Philadelphia.

Barucco, Suzanna E.

- 1992 *National Register of Historic Places Registration Form, Atwater Kent Manufacturing Company (South Plant)*. Martin Jay Rosenblum and Associates, Philadelphia, Pennsylvania.

Douglas, Alan

- 1988 *Radio Manufacturers of the 1920's*. Vestal Press, Ltd., New York.

Fogg, W. R.

- 1925 "A Fourteen Acre Radio Factory." *The Building Age and National Builder*, September 1925, pp. 140-141.

General Services Administration (GSA)

- 1995 History of the GSA's use of the North Plant facility, presented in captioned photographs. Located at the General Services Administration, 5000 Wissahickon Avenue, Philadelphia, Pennsylvania.

Ingham, John N.

- 1983 *Biographical Dictionary of American Business Leaders*. Greenwood Press, Westport, Connecticut.

Ketchum, Milo S.

- 1912 *The Design of Steel Mill Buildings*. McGraw-Hill Book Company, New York.

Meyer, Richard

- 1992 "A Determination of Eligibility Investigation of the Department of Veterans Affairs Property, 5000 Wissahickon Avenue, Philadelphia, Pennsylvania." Prepared for the General Services Administration, Philadelphia, Pennsylvania, by John Milner Associates, West Chester, Pennsylvania.

*National Cyclopedia of American Biography* [NCAB]

- 1967 "Emile George Perrot." *National Cyclopedia of American Biography*. J.T. White, Clifton, New Jersey, vol. 43, p. 24.

*Newsweek*

- 1939 "Atwater Kent's Museum." *Newsweek*, July 3, pp. 26-27.

*New York Times*

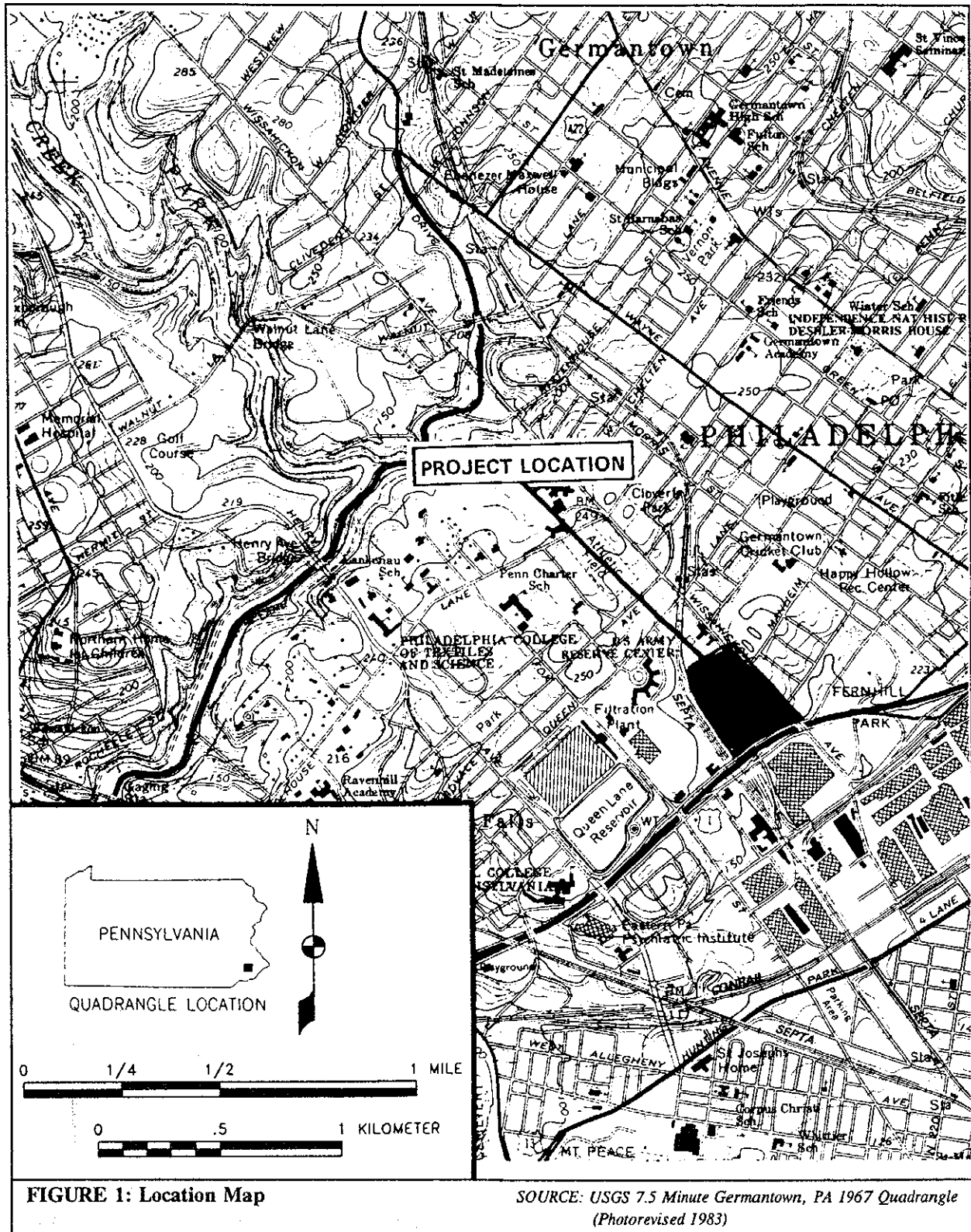
- 1949 "A. Atwater Kent, Radio Pioneer, 75." *New York Times*, March 5, 1949, p. 17.
- 1949 "\$1,335,000 Is Left to Charity By Kent." *New York Times*, March 31, 1949, p. 50.

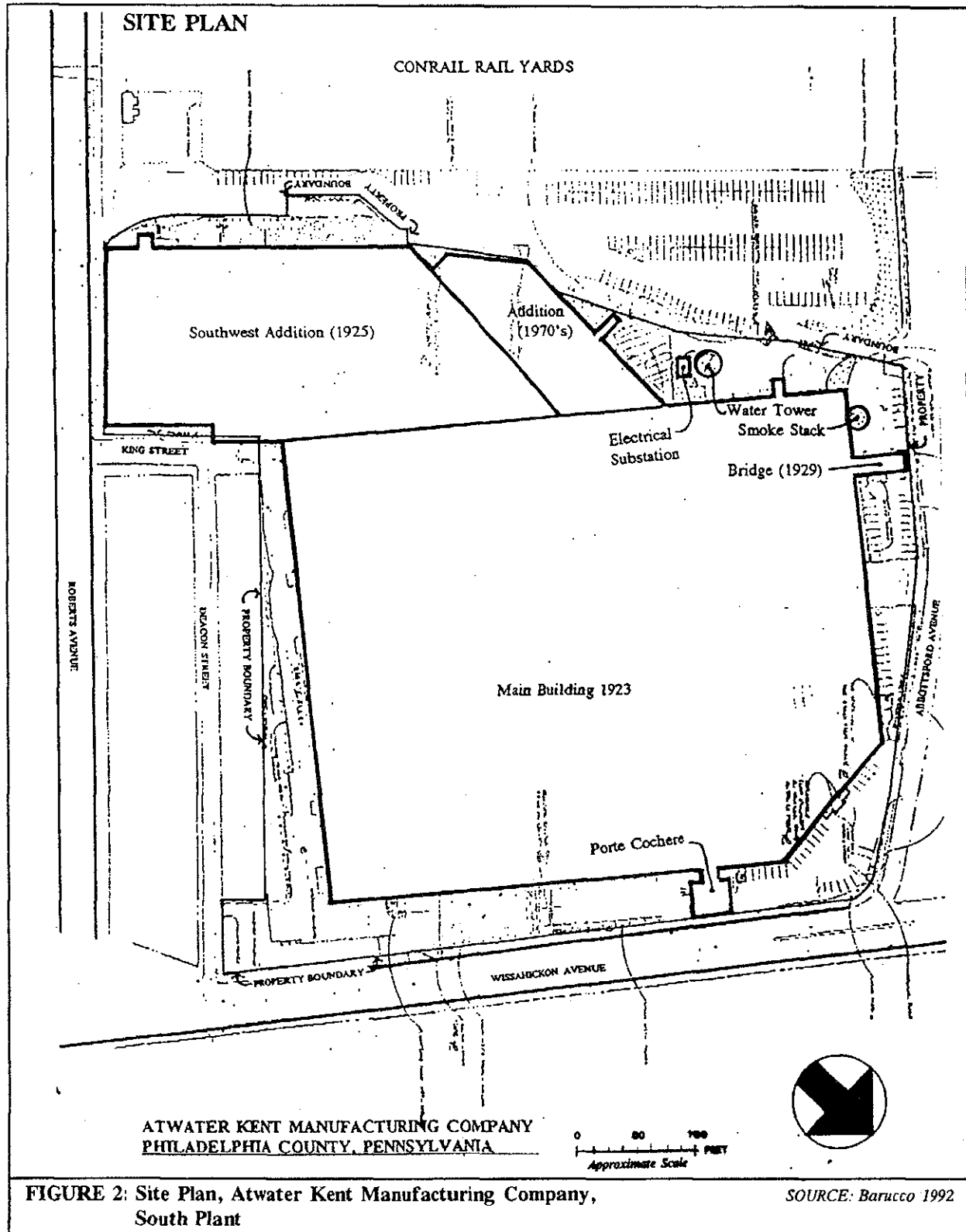
Tatman, Sandra L., and Roger W. Moss

- 1985 *Biographical Dictionary of Philadelphia Architects: 1700-1930*. The Athenaeum of Philadelphia, Pennsylvania.

United States Patent Office

- 1920 *Roof Structure, Patent No. 1,347,669*. United States Patent Office, Washington, D.C.





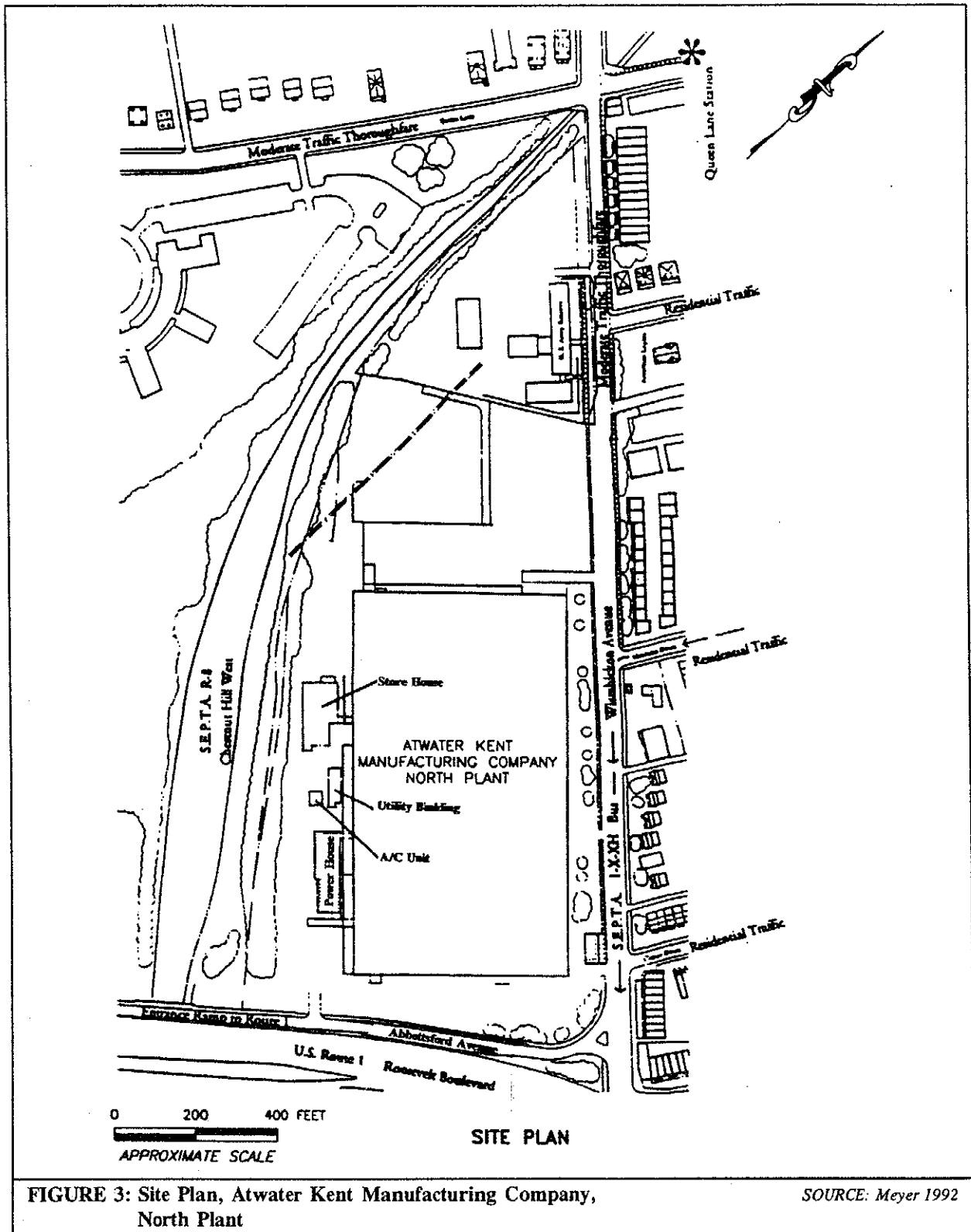


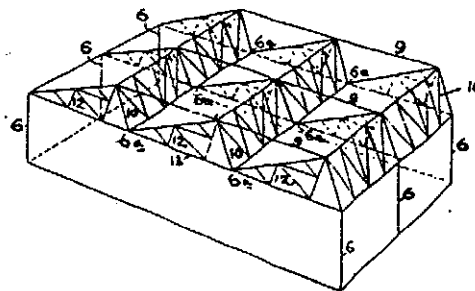
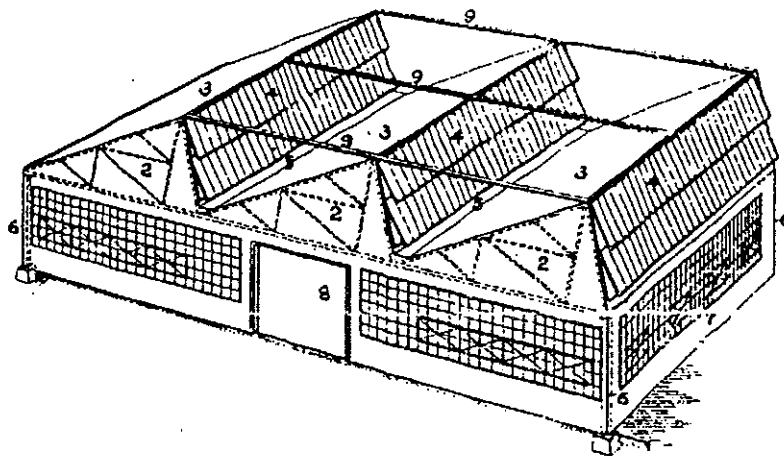
FIGURE 3: Site Plan, Atwater Kent Manufacturing Company,  
North Plant

SOURCE: Meyer 1992

1,347,669.

W. F. BALLINGER AND C. H. SHIVERS.  
ROOF STRUCTURE.  
APPLICATION FILED JULY 31, 1919.

Patented July 27, 1920.  
4 SHEETS—SHEET 1.



Inventors  
Walter F. Ballinger  
Clifford H. Shivers  
*[Signature]*  
Attorney

FIGURE 4: Super-Span Roof

SOURCE: US Patent Office 1920, Patent No. 1,347, 669

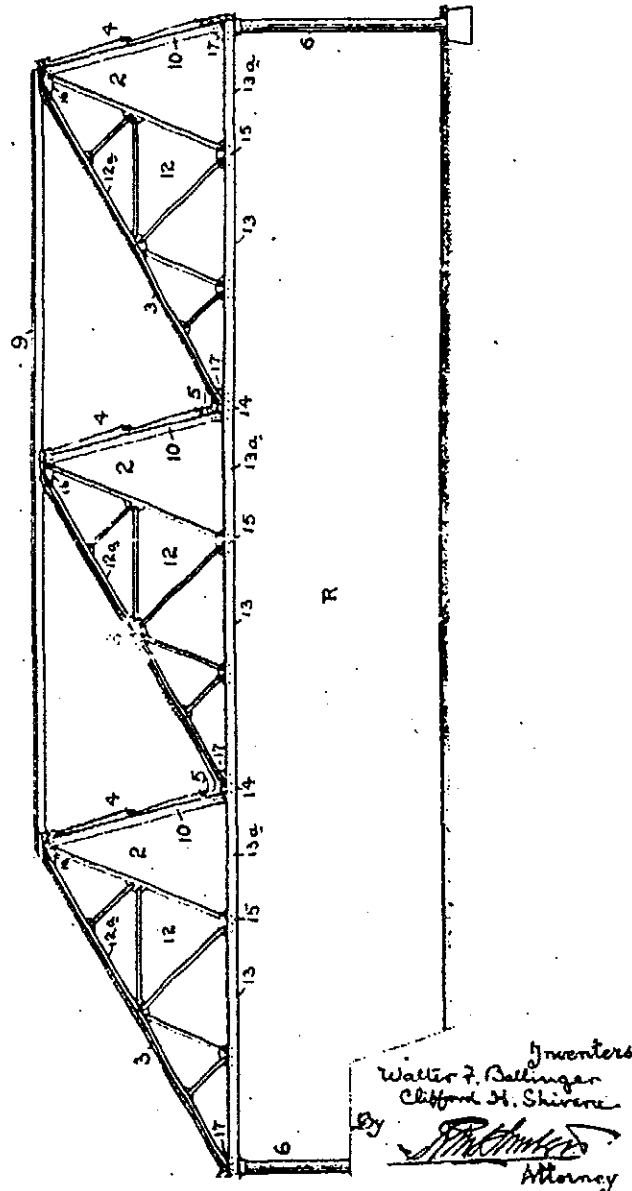
1,347,669.

W. F. BALLINGER AND C. H. SHIVERS.  
ROOF STRUCTURE.

APPLICATION FILED JULY 31, 1919.

Patented July 27, 1920.

4 SHEETS-SHEET 2.



Inventors  
Walter F. Ballinger  
Clifford H. Shivers  
By *[Signature]*  
Attorney

FIGURE 5: Super-Span Roof

SOURCE: US Patent Office 1920, Patent No. 1,347, 669